



# Indianapolis-Marion County Forensic Services Agency *Focus*

Serving the Citizens &  
Criminal Justice System  
of Marion County

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## *Gunshot Residue Analysis & Distance Determination*

The Crime Lab receives inquiries about gunshot residue testing or as oftentimes requested, "GSR" testing. Generally, this request is made in order to determine whether an individual fired a gun by examining for the presence of gunshot residues on the suspect's hands. The Association of Firearms and Toolmark Examiners defines gunshot residues as follows: The total residues resulting from the discharge of a firearm, it includes both gunpowder and primer residues plus metallic residues from projectile, fouling, etc. The components of a metal cartridge or round of ammunition includes a bullet, gunpowder, primer and a metallic cartridge case that contains these components. When a gun is fired, the firing pin strikes the primer which explodes thereby igniting the gunpowder. The gases produced from the rapidly burning gunpowder force the bullet from the cartridge case and through the barrel.

It is not uncommon for detectives to request that the hands of the suspected shooter be

swabbed in an attempt to determine whether the suspect fired a gun. By swabbing the hands of the



*Residue Generated by Handgun Discharge*

suspect, investigators hope to identify "primer residues". Primer residues typically include the elements lead, barium and antimony. The detection of these elements would be conducted by instrumental analysis. The presence of these elements is not conclusive evidence that someone fired a gun; rather, that someone was in the presence

of those elements. Therefore, the interpretation of the presence of these elements can be misleading. As a result, the I-MCFSAs, as well as the Indiana State Police and FBI, do not conduct this type of analysis.

Not to be confused with "GSR testing," a distance (range) determination is an analysis that can be conducted on a garment of clothing and/or skin of the victim. A distance determination analysis may provide an approximate muzzle to target distance. Please remember that a distance determination request must be probative to the investigation. A range determination is not probative unless there is a dispute concerning the distance between shooter and victim. An accurate analysis cannot be conducted unless the firearm and ammunition involved is submitted.

In conclusion, a distance determination test can be conducted at this laboratory; however a "GSR" swabbing request cannot.

- Firearms Section

## *Request for Analysis Cards*

The work of the Crime Lab is request-driven, generally by the use of request cards completed by a detective or prosecutor. Additionally, detectives can request that a Crime Scene Specialist respond to a crime scene for processing or that a Forensic Evidence Technician respond to the morgue to collect evidence during an autopsy.

With this in mind, the importance of properly completing a request card cannot be overstated. Proper completion of a

request card will help ensure that the right evidence is examined and the needed analyses are completed without having to waste time contacting the requesting investigator for further information.

Request cards contain spaces for specific information regarding which items of evidence are to be tested and what analyses are to be completed. Additionally, suspect information is important, i.e. name, date of birth, gallery number.

A brief case synopsis, court dates, and assigned prosecutor information is also important, when applicable. Investigators should also include contact information, which preferably includes a cell phone or pager number, in the event that additional questions arise during analysis.

A few moments spent on properly completing a request card can save a lot of time.

- F/S Ron Blacklock  
Deputy Laboratory Director

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## Of Note:

- The Crime Lab processes more than 4,500 drug cases per year which generally consist of marijuana, methamphetamine, cocaine and heroin
- Sixty NIBIN hits (links between cases on the National Integrated Ballistics Information Network) have been effected by the Firearms Section in 2009
- The Crime Scene Unit responded to 685 scenes in 2008, the majority consisting of serious crimes against a person



## Swabbing a Suspect Vehicle for Touch DNA

It is becoming increasingly common for detectives to request that an abandoned suspect vehicle be swabbed in an effort to recover touch DNA samples. These samples may aid in identifying who was in the vehicle and where they were seated. Traditional investigative doctrine would suggest swabbing discrete individual areas (e.g. rear view mirror, gear shift, steering wheel, etc.) and submitting these swabs to the lab. This has been shown to be an inefficient method that may possibly cause potential evidence to be missed.

Touch DNA analysis is done in an attempt to develop a DNA profile from items that an individual has touched. This means that the amounts of DNA in-

involved are at the very edge of sensitivity and frequently result in insufficient material being recovered from the scene. As a result the investigator should consider methods that attempt to maximize the amount of DNA recovered from these samples.



Swabbing a Vehicle

Taking the above into account, it

is a good idea to divide the target vehicle into 4 main interior areas. These represent the four main passenger areas: driver, front passenger and the two rear passengers. Thus the space that the driver would occupy should be swabbed with one swab. This would include steering wheel, gear shift, rear view mirror, interior door handle, etc. A similar approach should be used for the other three interior areas – that is one swab for each individual area. The exterior areas of the suspect vehicle should be treated in a similar manner. Notes should be taken indicating what areas were swabbed with each swab.

One objection to this method of vehicle examination is the possi-

ble mixing of DNA from different discrete areas. While this is a valid concern, one must consider the potential amounts of DNA being recovered are at the lower edge of detection using modern day technology. By limiting the number of swabs collected (but not the objects swabbed) then the amount of DNA recovered can be potentially increased. It is preferable that a mixed DNA profile is developed from one of these vehicle swabs as opposed to no profile at all.

By limiting the number of swabs used in this sort of investigation the chances of obtaining probative evidence can be enhanced.

- F/S David Smith,  
Serology Section Supervisor

## Collecting Handwriting Standards

One of the most common questions asked about handwriting cases is how to collect a handwriting sample from a subject. The following are suggestions for obtaining known handwriting specimens from individuals believed to be involved in preparing questioned writings. These suggestions should not be regarded as hard and fast rules. Handwriting identifications depend upon adequate known standards.

Have the writer complete the general handwriting forms (available from the Crime Lab). This consists of three (3) pages.

Have the writer give additional writing directly related to your case. This is where you will dictate to the writer what to write as follows:

- 1) Single Questioned Signature Cases - Obtain at least 15 repetitions of the questioned signature, including addresses and numbers,

- etc. on separate sheets of paper.
- 2) Multiple Questioned Signature Cases - Obtain at least 10 repetitions of each questioned signature if possible on separate sheets of paper.
- 3) Check Faces or Forms - Use check blanks or comparable blank forms (available from the Crime Lab) for obtaining known writing and obtain at least 10 repetitions.
- 4) Extended Writing - When large amounts of writing are in question, dictate selected paragraphs to the writer. Generally, 3 repetitions will suffice.

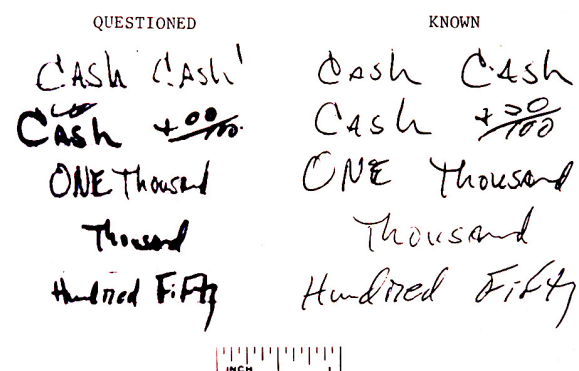
It is important to remember that known and questioned writing must be comparable. For instance, obtain handwriting to compare to handwriting, hand printing to compare to hand printing, upper case letters for upper case letters, etc. When possible, submit the original item

in question for comparison. It is possible to conduct a handwriting comparison with a photocopy however, photocopies can limit the examination.

In some cases, additional non-request handwriting may be necessary, as long as it is comparable (same letters and letter combinations) to the questioned writing. This may include course of business papers, cancelled checks, employment applications, personal correspondence, etc.

Additional writing specimens are always acceptable as it is impossible to submit too much writing for comparison. If you should have any questions about the collection of handwriting for comparison, please feel free to contact Lee Ann Harmless, Forensic Supervisor, Forensic Document Examiner.

- F/S Lee Ann Harmless,  
Forensic Documents/Latent Prints  
Section Supervisor



Court chart depicting the identification of the writer of stolen checks



## Footwear Impression Analysis

A commonality at crime scenes is that the offender enters and exits the scene. As a result, potential evidence can be gathered if the investigator doesn't overlook the not so obvious.

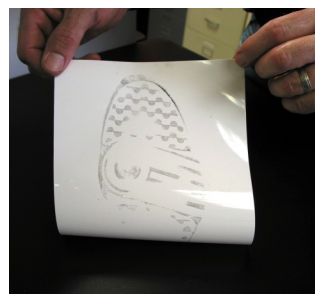
Humans have used foot impressions or footwear impressions to track animals and other humans for thousands of years. Think of the emotions around our nation in 1969 when televisions displayed the grainy image of a footwear impression on the moon's surface as the result of American Astronaut Neil Armstrong being the first human to walk on the moon. The oldest recorded use of footwear impression evidence in a criminal investigation was in the Richardson case (Scotland) in the autumn of 1786. The case involved the murder of a young girl and footwear impression evidence being located in a marsh near a cabin where the girl had lived. A subsequent search revealed a trail of footwear impressions, blood droplets and a bloody hand print. The investigator made a cast of the footwear impression which he described as a boot-type impression with patch work and many nails. At the funeral of the girl, the investigator compared the cast to individuals attending the funeral and discovered a match with Richardson's boots. Another footwear impression examination involved the bloody footwear impressions discovered at the scene of the murders of Nicole Brown Simpson and Ron Goldman. FBI Special Agent William Bodziak concluded that the bloody footwear impressions recovered at 875 South Bundy Drive were consistent with the outsoles from Italian made Bruno Magli shoes. Prior to the civil trial against O.J. Simpson, a photograph was presented depicting O.J. Simpson wearing a pair of Bruno Magli shoes, even though he denied under oath that he owned a pair of these shoes. The actual shoes in this case were never recovered.

Like fingerprints, footwear im-

pression evidence can be discovered in the form of latent or patent impressions. A latent footwear impression is evidence in which the deposit is not obvious to the investigator, but with enhancement, possibly just lighting, can be observed and recovered. A patent footwear impression is evidence which is readily observed either two-dimensionally such as dust, blood and mud, or three-dimensionally such as snow, mud and loose soil.

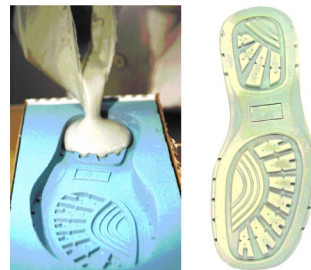


Recovering a footwear impression with a gel lifter



Recovered footwear impression

The recovery or collection of footwear impression evidence depends on how the impression was deposited; however, all footwear impression evidence must be photographed first. A photograph must have a proper scale positioned by the footwear impression evidence, and the camera must be adjusted so that the scale and impression fill the entire frame of the image in focus. Other lighting techniques can be used to enhance detail in the footwear impression. This permits "true to scale" prints to be made for either laboratory analysis or court purposes.



Casting a three-dimensional impression (left) and the completed cast (right)

Recovery of a two-dimensional impression once again depends on how the impression was deposited. For instance, if it is a dust-type impression, a gelatin lifter, tape lifter or electrostatic lifter will adequately recover the impression. If the impression was deposited wet, but has dried, the electrostatic lifter will be ineffective, so a light application of a fine fingerprint powder such as magna powder and a gelatin lifter or tape lifter should be used.

Recovery of a three-dimensional impression in loose soil or mud can be effectively collected by pouring a dental stone or Trax-tone cast. If the three-dimensional impression is in snow, other techniques must be applied prior to casting such as spraying the impression with snow print wax or paint primers. Photography should be completed prior to any enhancement procedure and immediately after each enhancement procedure.

Are examiners always able to determine if a particular shoe made a particular footwear impression?

1. No. Sometimes the footwear impression evidence does not display enough individual detail to allow for an identification, or the shoe in question has not sustained enough wear or damage to make the shoe outsole unique in comparison to other shoes made by the same mold.
2. If the footwear impression evidence does lack random damage or individual characteristics, but does display a clear pattern design, the footwear impression evidence (unknown) can be compared to an outsole of a shoe (known) to determine if they are similar in class design characteristics.
3. A misconception of footwear examinations is that an examiner can determine a shoe size just by examining a footwear impression (unknown). This is not true because the shoe size is actually a measurement of the inside dimensions of the shoe and not the length of the outsole as it would appear in an impression. So, in some instances, a broad estimate can be made of possible shoe sizes. The exact shoe size cannot be determined unless information imprinted within the impression reveals the actual shoe size.

- F/S Richard Amberger  
Firearms Examiner



Unknown Impressions



Known Test Impressions



Known Shoes



Known Shoes



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**Serving the Citizens &  
Criminal Justice System  
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Amanda Sondgeroth, Forensic Evidence Tech. Sup.  
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Newsletter edited by Ronald Blacklock



*The Indianapolis-Marion County Forensic Services Agency shall provide forensic services to the Marion County Community by supporting the needs of the Criminal Justice System. The forensic services provided shall be built on a foundation of quality, integrity, accountability and ethics. All I-MCFSa personnel shall strive to meet forensic needs of today and into the future in all their work endeavors.*

**Forensic Services Board**

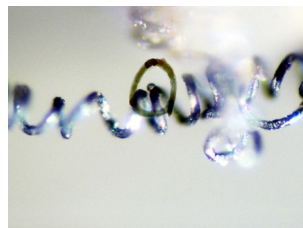
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## ***Trace Evidence Provides Investigative Information***

Whenever a crime is committed, there is a possibility of a transfer of trace evidence. Trace evidence transfer may occur several ways such as: between the suspect and the victim, between the suspect and the scene, or between the victim and the scene. Trace evidence analysis is one of the most diverse and unique of all disciplines in Forensic Science. An I-MCFSa Trace Chemist sees a wide range of evidence requiring them to be proficient in several areas, including: hairs and fibers, paint (automotive and architectural), headlamp filaments, physical matches, clothing, fire debris, acids/bases, and miscellaneous unknowns.

Many times the Trace Section is called upon to first scrutinize items for "trace." The first step in the analytical process is the identification, proper collection and packaging of those microscopic bits and pieces that have potential as evidence. The trace

evidence collected can be compared at a later time to demonstrate a possible relation to a known suspect.



*Auto Headlamp Examination*

Trace evidence can provide investigative information, such as a hair with different racial characteristics than a victim. Fibers of a certain color and morphology that are found on the victim may provide investigative information as to contact with carpet of a certain color.

In hit-and-run cases, providing samples of the damaged area of whatever was hit can give inves-

tigative information. Paint samples may have transferred onto the pedestrian victim's clothing while being struck, or onto the damaged area of a vehicle that was hit. Even if the crime was not witnessed, paint samples can give information about the color of the suspect's vehicle.

Trace evidence can be a very useful tool, not only after you have a suspect, but as a way to help lead you to that person. The investigator must constantly keep this in mind and search, recognize, secure, and preserve items that can be examined for precious bits of investigative information.

- F/S Tami Atwell,  
Trace Chemist

- F/S Bob McCurdy,  
Chemistry Unit Supervisor

***"Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects. All of these and more, bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent. Only human failure to find it, study and understand it can diminish its value."***

**Dr. Edmond Locard**